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ABSTRACT

An instructor's manual and student activity guide on radio and television repair are provided in this set of prevocational education materials which focuses on the vocational area of trade and industry. (This set of materials is one of ninety-two prevocational education sets arranged around a cluster of seven vocational offerings: agriculture, home economics, distributive education, health occupations, world of work, trade and industry, and office occupations.) The instructor's guide is organized into the following elements: title of activity, duration of activity (five to eight periods), activity goals, four instructional objectives, and activity implementation (description, materials needed, safety considerations, teacher preparation prior to class, during the class, follow-up activities, and a sheet of questions to be duplicated). The student activity guide based on building a crystal set receiver, provides step-by-step instructions (narrative and illustrations) for completing each instructional objective. At the end of each set of instructions is a student check point (evaluation activity). Occupational descriptions for a radio repairer, tape-recorder repairer, and television and radio repairer conclude the document.
(JH)

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ED169359

T & I - RADIO AND TELEVISION REPAIR

Kit No 70

INSTRUCTOR'S MANUAL

Prepared by

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**State Department of Education
Office of Vocational Education
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In Cooperation With

**Vocational Education Media Center
Clemson University
Clemson, South Carolina 29631**

1978

CE 020 544

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Department of Health, Education and Welfare, Office of Education.*

TITLE OF ACTIVITY

Kit No. 70, T & I — Radio and Television Repair

DURATION

Main Activity: 4 — 5 periods

Follow-up Activity: 1 — 3 periods

GOALS

The student will learn how to use the soldering iron for tinning and soldering.

The student will make a crystal set receiver.

INSTRUCTIONAL OBJECTIVES

The student will wind coil "A" on the coil form.

The student will wind coil "B" on the coil form.

The student will assemble the crystal set receiver.

The student will tune in a radio station.

VOCATIONAL CLUSTERS

None

ACTIVITY IMPLEMENTATION

A. Activity Description

By building a crystal radio, the student will learn about some of the tools, methods, and components used in radio and television repair.

B. Safety

1. Safety glasses must be worn when soldering.
2. Soldering iron is hot — do not touch tip.
3. X-acto knives are sharp — care must be taken in their use.

C. Materials Required

1. Audio Visual Equipment — None
2. Technical Equipment
 - 5 soldering irons
 - 5 safety glasses
 - 5 wire strippers
 - 25 bases
 - 5 sets headphones
 - 25 variable tuning capacitors (attached to base)
 - 25 crystal diodes
 - 8 X-acto knives
 - 5 asbestos pads 12" x 12"
 - 5 ground wires
 - 5 antennas
3. Expendable Materials
 - 1 roll scotch tape
 - 1 pound rosin core solder
 - 1200 feet No. 20 copper wire
 - 5 rulers

D. Preparation Prior to Class

Set up five stations for soldering. At each station place the following items:

- 1 soldering iron
- 1 pair safety glasses
- 1 wire stripper
- 1 X-acto knife
- 1 asbestos pad
- No. 20 copper wire
- solder
- scotch tape
- 1 ruler

For each student, you will need the following items:

- 1 base
- 1 coil form
- 1 crystal diode

Set up five stations for testing the crystal set receiver. At each station place the following:

- 1 headset
- 1 ground wire — hook this up to a cold water pipe or anything that is grounded.
- 1 antenna wire — hook this up to a large metal surface such as an outside drain pipe, grating over a window, or even a car.

When hooking up the ground and antenna wire, make sure they are in contact with the metal.

E. During Class Session

INTRODUCTION

Return to the thrilling days of yesteryear when a family crowded around the table with a set of black earphones in a bowl in the center of the table. Someone adjusted a cat's whisker and a coil in the hope of hearing one of the few radio stations.

Don't laugh! The family was listening to a crystal radio set. The earphones were in the bowl to echo the sound so that more than one person could hear.

The crystal radio set is the forerunner of today's solid state radio. Because vacuum tubes were scarce and very expensive, people built their own form of radios.

The ingredients of a crystal set are simple; a coil, a variable condenser, a crystal, a headset, and a long wire for an antenna.

In the old days the coil was hand wound around an empty salt box and a crystal of galena was used. A wire, called a cat's whisker, was touched to the crystal in different places in order to find a station. We will use a modern diode and a dial type tuner.

Just for fun, let's build the kind of set our parents and grandparents used to hear. We will use store-bought parts, though.

The sound will be very pure, but the set can only receive powerful, nearby stations. It has a hard time separating signals from different stations. The best part about this set is that it uses no batteries, no power, no tubes; nothing can wear out. The only expense is the original cost of the parts.

Let's get started!

TO THE TEACHER

Assist students only when called upon.

F. Follow-up Activities

1. Have students complete a VIEW Fact Sheet.
2. Look for jobs in the want ads for radio and television repair persons.
3. Take a field trip to a service repair center.

ANSWER KEY

None

MASTERS FOR DUPLICATION

VIEW Fact Sheet

VIEW FACT SHEET

NAME _____ CLASS _____ OCCUPATION _____

- A. List the advantages (good points) of this occupation (job).
- B. List the disadvantages (bad points) of this occupation (job).
- C. List three things you should know to do this occupation (job).
 - 1.
 - 2.
 - 3.
- D. What type of education should you get to be prepared (do) for this occupation (job)?
- E. What courses must you take to go into this occupation (job)?
- F. What do you think your future in this occupation (job) will be?
- G. What wage can you expect in this occupation (job)?
- H. What are the working hours of this occupation (job)?
- I. To learn more about this occupation (job), write to:
- J. Using a scale of 1 to 5, circle the number that measures your interest in this occupation (job) as a possible career.

I don't like it. ← 1 2 3 4 5 → I like it.

T & I – RADIO AND TELEVISION REPAIR

Kit No. 70

STUDENT

LEARNING ACTIVITY PACKAGE

Prepared by

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T & I - RADIO AND TELEVISION REPAIR

INTRODUCTION

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Let's get started!

GOALS

The student will learn how to use the soldering iron for tinning and soldering.

The student will make a crystal set receiver.

DIRECTIONS

Obtain the materials you will need for the activity.

Follow the instructions step-by-step.

There are checkpoints for each objective. Be sure you can complete the checkpoint and have your instructor initial your check sheet before going on to the next objective.

When the crystal set is complete, you will be able to hear one or more local AM stations.

Carefully unsolder and unfasten all parts and return them to your instructor when you are finished.

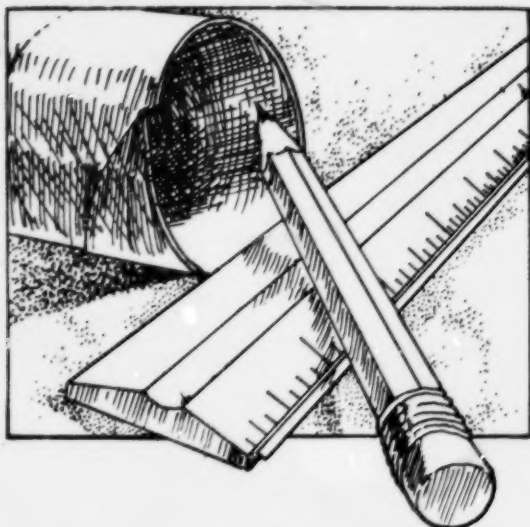
MATERIAL

- 1 base (has Fahnstock clips and variable capacitor)
- 1 cylinder (toilet paper roll)
- 1 crystal diode
- No. 20 copper wire

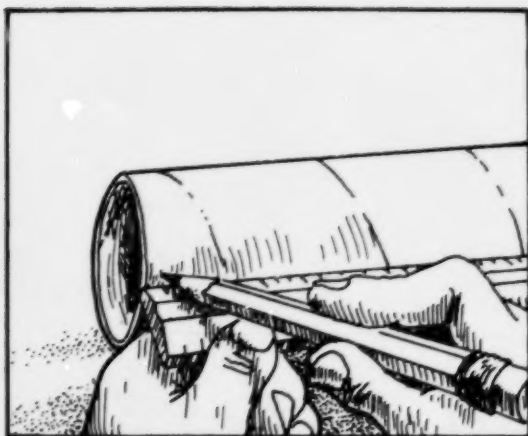
PROGRAMMED TEXT

Instructional Objective 1

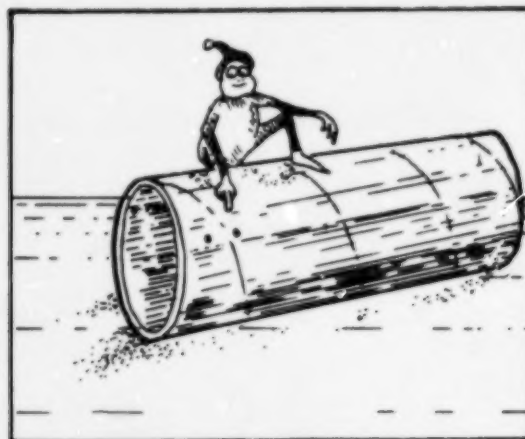
The student will wind coil "A" on the coil form.



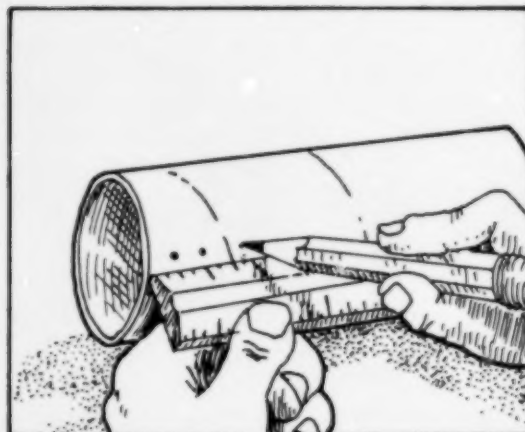
STEP 1 — Place in front of you the core from a roll of bathroom tissue, a ruler, and a pencil.



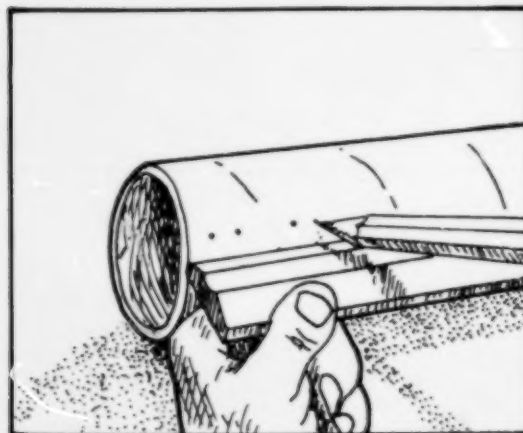
STEP 2 — Measure in, from one end of the core, $\frac{1}{4}$ inch (.635 cm) and mark it.



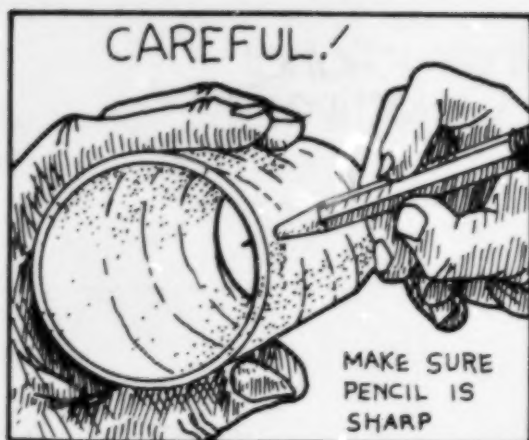
STEP 3 — Measure in $\frac{1}{2}$ inch (1.27 cm) and mark it.



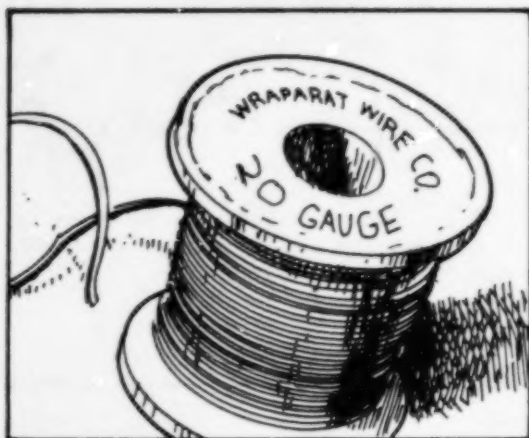
STEP 4 — Measure in 1 inch (2.54 cm) and mark it.



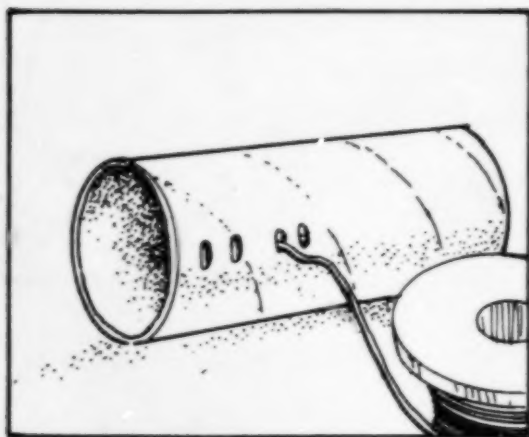
STEP 5 — Measure in $1\frac{1}{4}$ inches (3.175 cm) and mark it.



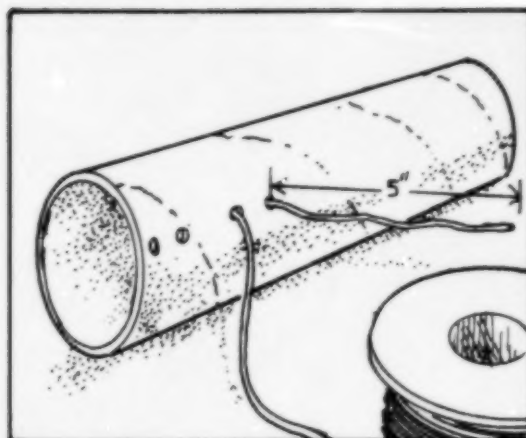
STEP 6 — Now, with a pencil or another sharp object, punch holes in the core where you made the marks. Be careful not to bend the core.



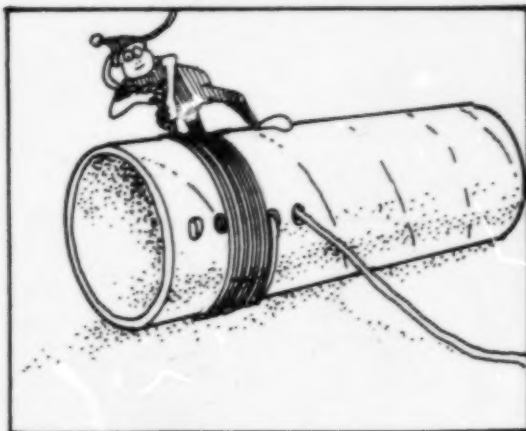
STEP 7 — Obtain the roll of No. 20 copper wire.



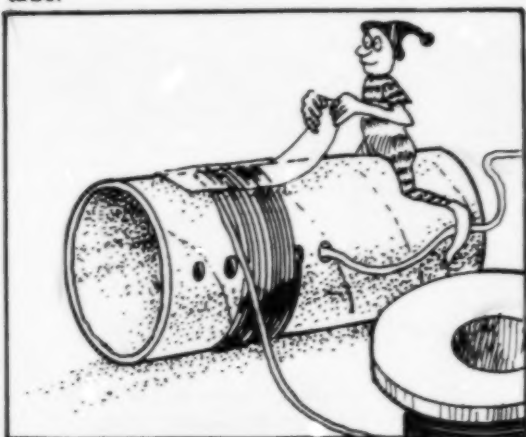
STEP 8 — Put the copper wire through the third hole from the end of the tube.



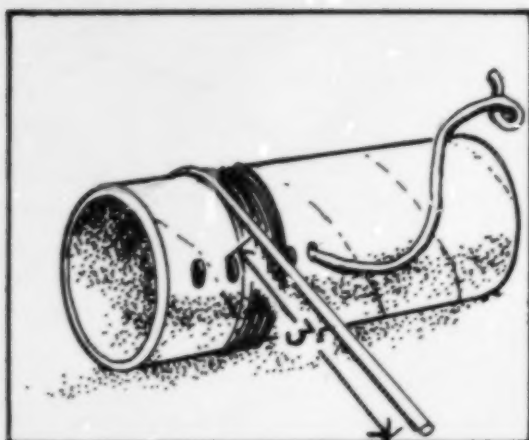
STEP 9 — Now, bring it up through the fourth hole from the end and leave 5 inches (12.7 cm) sticking out.



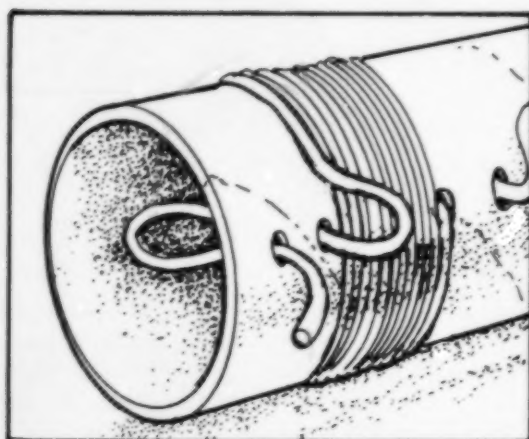
STEP 10 — Grab the wire by the third hole and start winding it around the tube. Stop when you have made 20 turns around the tube.



STEP 11 — Make sure the wire is kept tight and close together. Place a piece of tape over the wire to keep it in place.



STEP 12 — From the second hole, measure the wire to 3 inches (7.6 cm) and cut it.



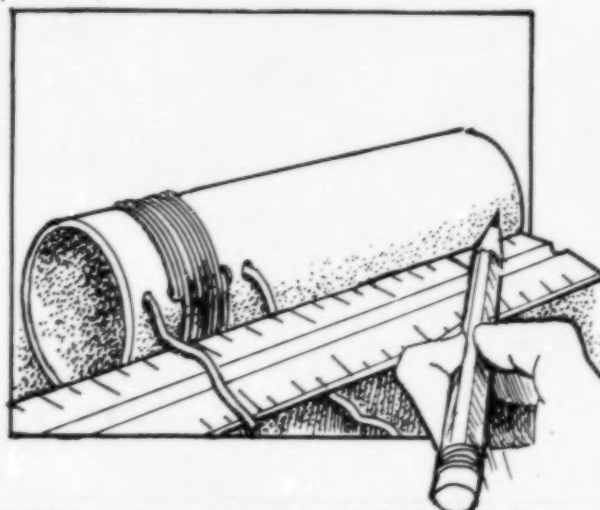
STEP 13 — Now, take the wire and put it through the second hole and up through the first hole.

Check Point

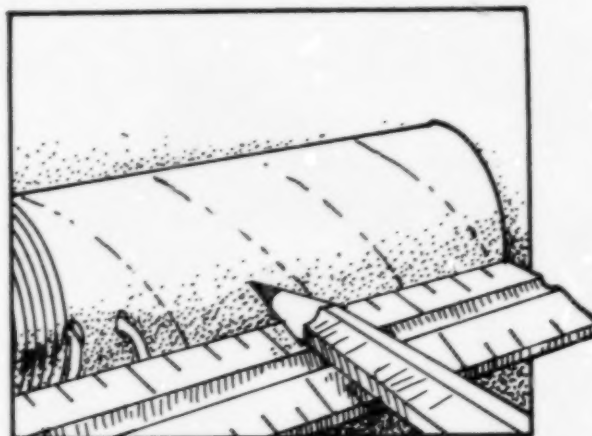
Did you measure the holes correctly?
Did you measure the wire correctly?
Did you make 20 turns for coil A?

Instructional Objective

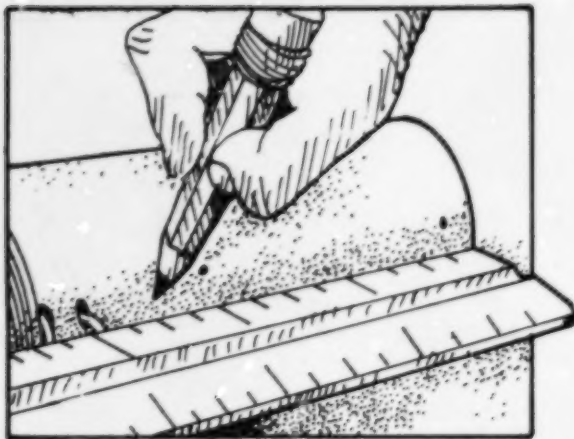
The student will wind coil "B" on the coil form.



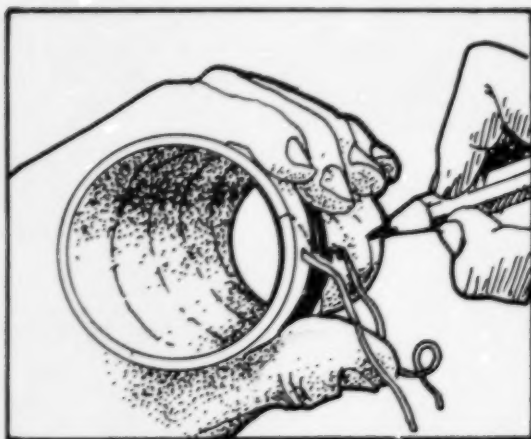
STEP 1 — Measure in from the other end of the tube 1/4 inch (.635 cm) and mark it with a pencil.



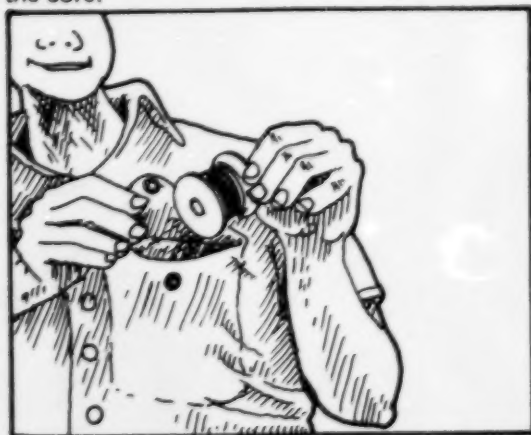
STEP 2 — Measure in 2-1/2 inches (6.35 cm) and mark it.



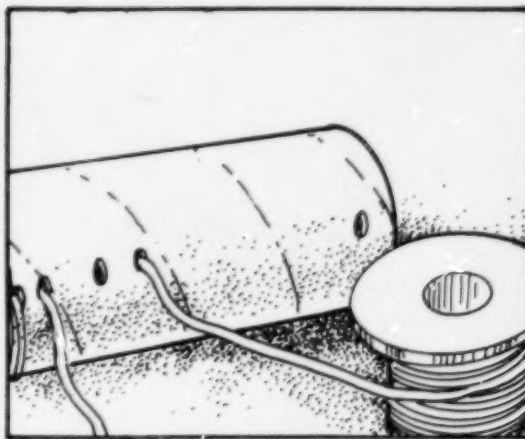
STEP 3 — Measure in 2 3/4 inches (6.99 cm) and mark it.



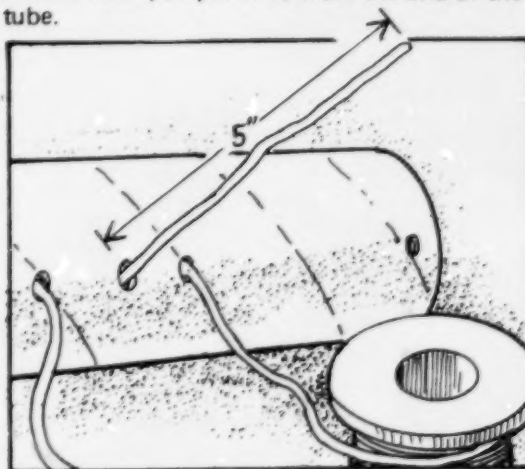
STEP 4 — Now, with a pencil or another sharp object, punch holes in the core where you made the marks. Be careful not to bend the core.



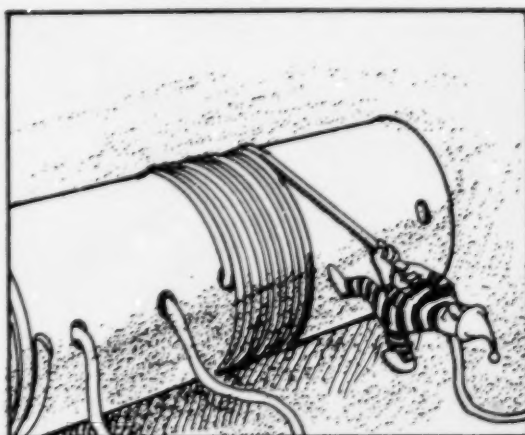
STEP 5 — Obtain the roll of No. 20 copper wire.



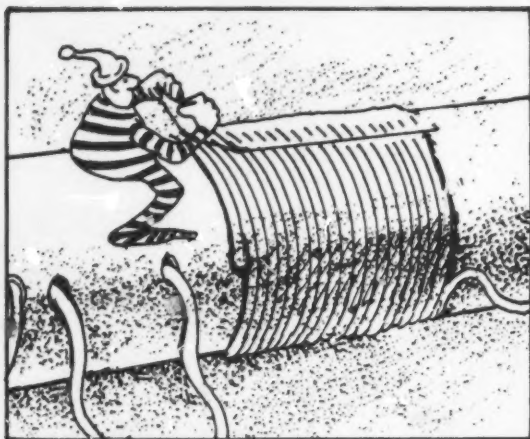
STEP 6 — Put the copper wire through the second hole you punched from the end of the tube.



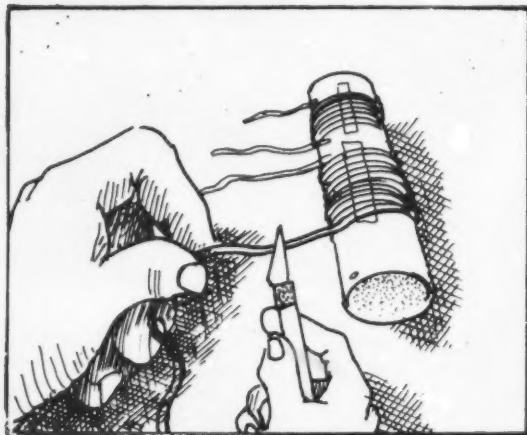
STEP 7 — Now, bring it up through the third hole from the end and leave 5 inches (12.7 cm) sticking out.



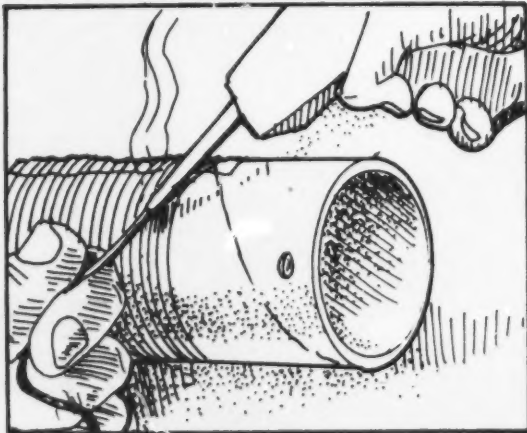
STEP 8 — Grab the wire by the second hole and start winding it around the tube. Stop when you have made 45 turns around the tube.



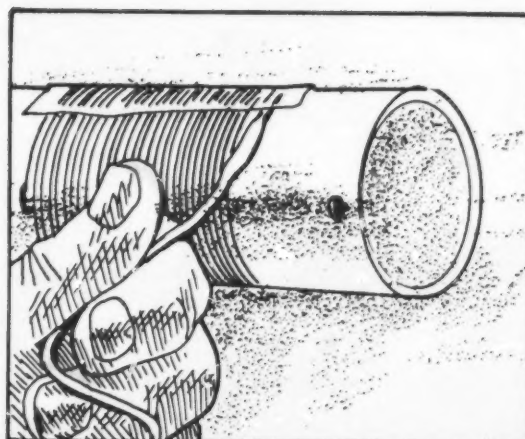
STEP 9 — Make sure the wire is kept tight and close together. Place a piece of tape over the wire to keep it in place.



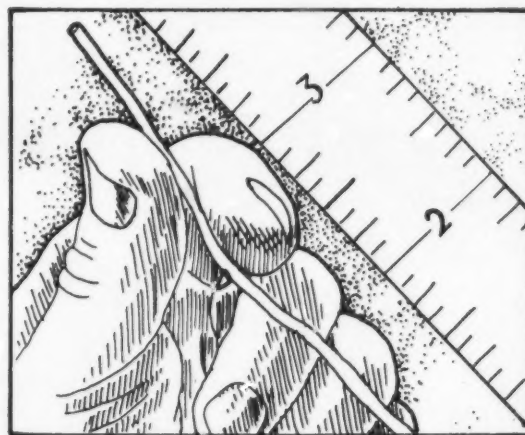
STEP 10 — Using an X-acto knife, scrape the enamel off all sides of one inch (2.54 cm) of the wire past the point where you taped the wire. Do not cut the wire or let it break.



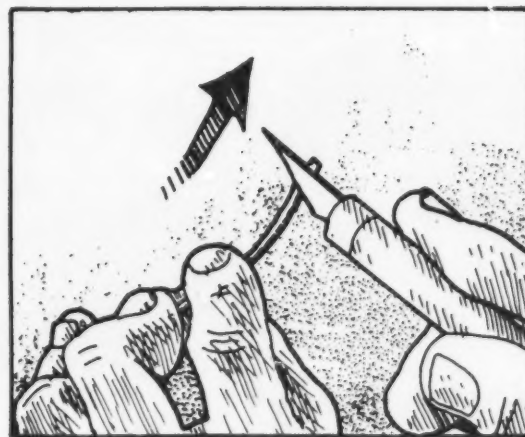
STEP 11 — Hold a heated soldering iron on the scraped wire for a few seconds. Hold solder on the wire and hold the soldering iron against the wire and solder together.



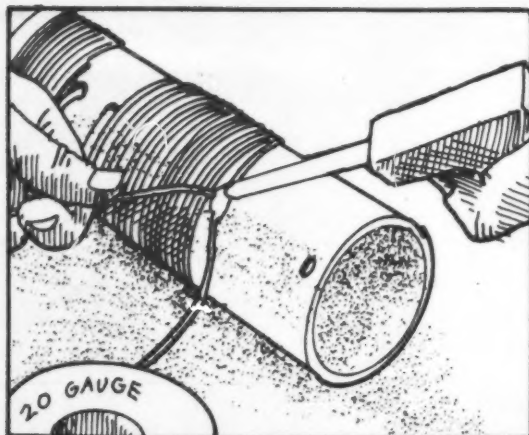
STEP 12 — Now you have a light coat of solder on the wire. This is called tinning.



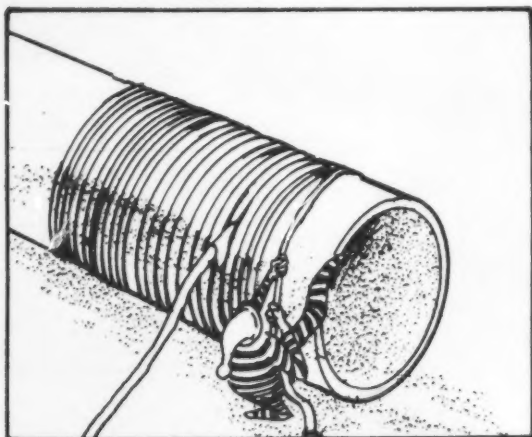
STEP 13 — Obtain a 4 inch (10.2 cm) piece of No. 20 copper wire.



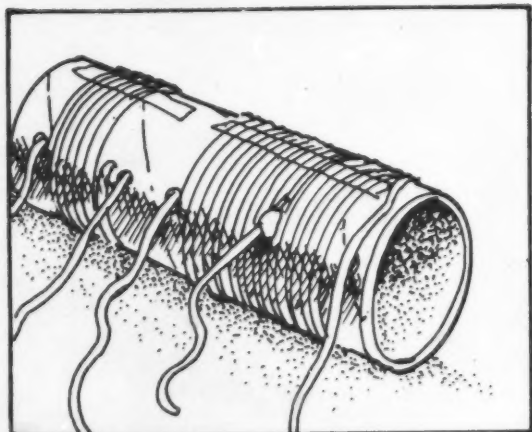
STEP 14 — Using the X-acto knife, scrape the enamel off all sides on one end of the wire. Expose about 1/4 inch (.635 cm) of bare wire.



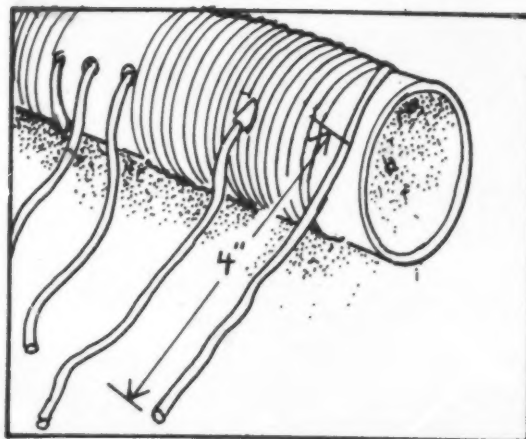
STEP 15 — Fasten this stripped wire to the coil wire which you scraped and tinned by heating the two wires and adding more solder.



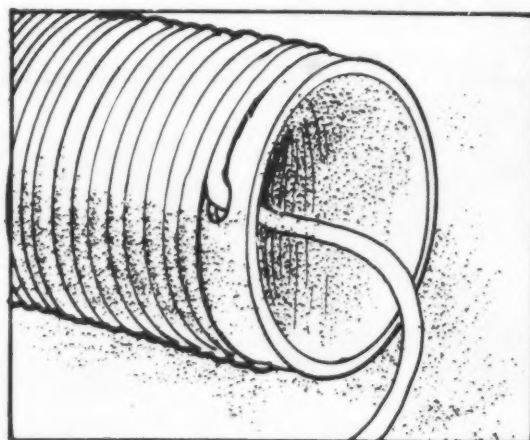
STEP 16 — Now continue to wrap the wire around the core. Wrap 45 turns and keep them close and tight.



STEP 17 — Place a piece of tape over the wire to keep it in place.



STEP 18 — Cut the wire, leaving about 4 inches (10.2 cm) hanging loose from the hole.



STEP 19 — Take the end of the wire, stick it through the hole, and bring it out through the end of the tube.

Check Point

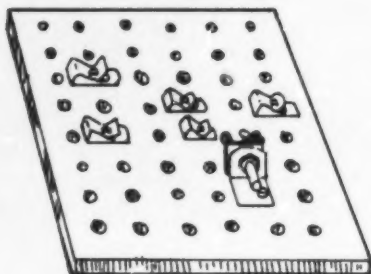
Did you make the proper number of turns around the core?

Did you tin the wire properly?

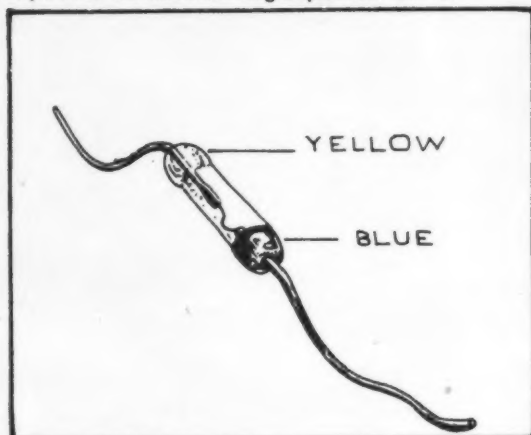
Did you properly solder the 4 inch (10.2 cm) piece of wire to the tinned piece?

Instructional Objective

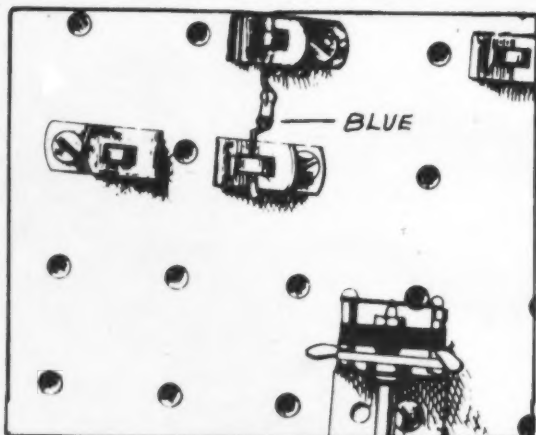
The student will assemble the crystal set receiver.



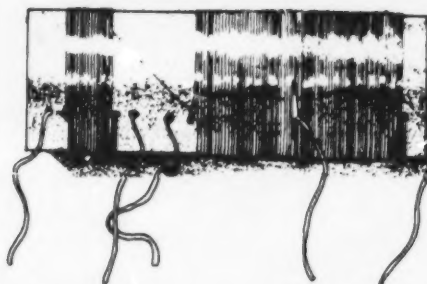
STEP 1 — Obtain the base that has the spring clips and variable tuning capacitor on it.



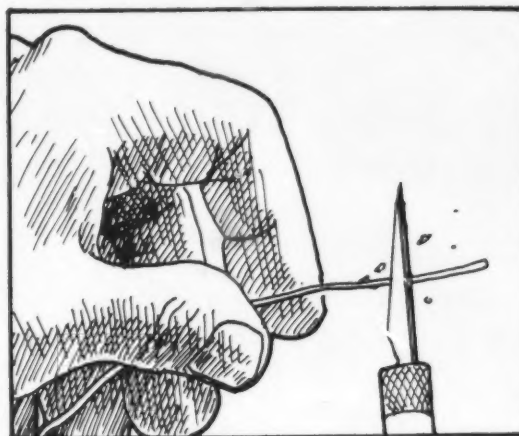
STEP 2 — Obtain a germanium diode.



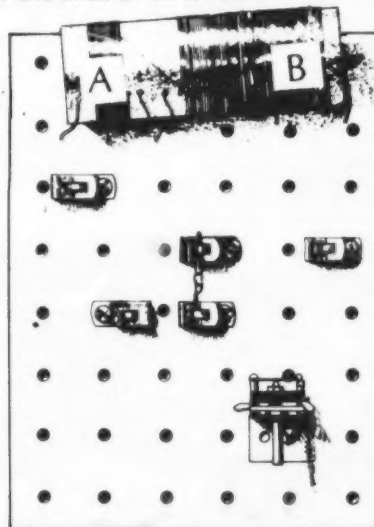
STEP 3 — Clip the diode into the fahnstock clips exactly as shown.



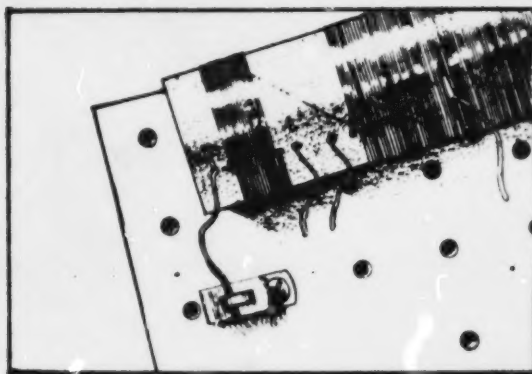
STEP 4 — Obtain the coil form.



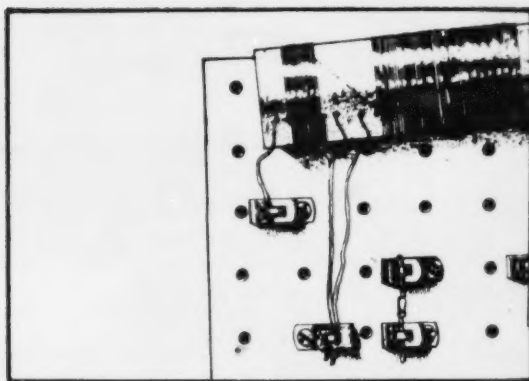
STEP 5 — Scrape 1/2 inch (1.27 cm) off all sides of the ends of all wires.



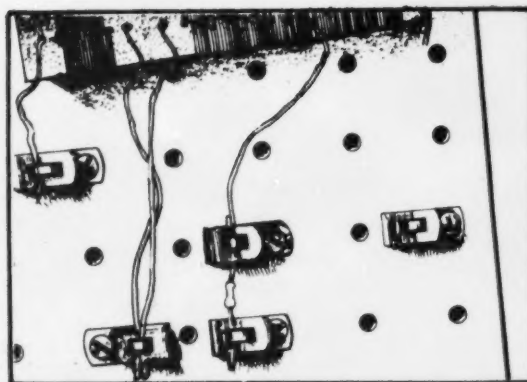
STEP 6 — Place the coil at the back of the base with coil "A" on the left and coil "B" on the right.



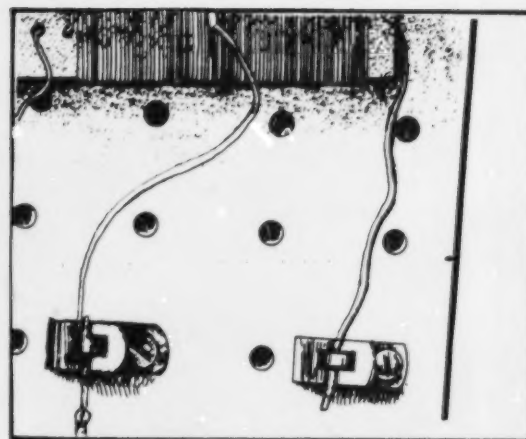
STEP 7 — Take the wire on the left, that leads to coil "A" and place it in the fahnstock clip as shown.



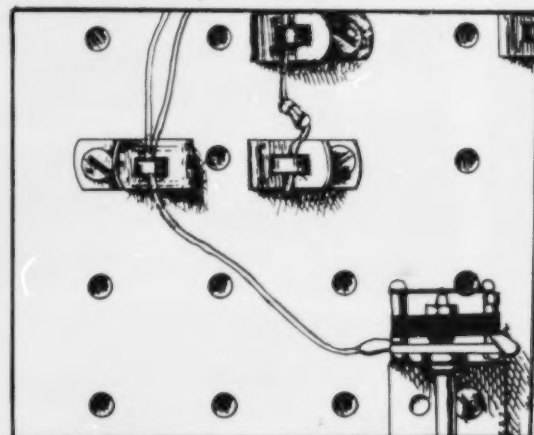
STEP 8 — Take the second and third wires from the left, these wires are from coil "A" and "B", and place them in the fahnstock clip as shown.



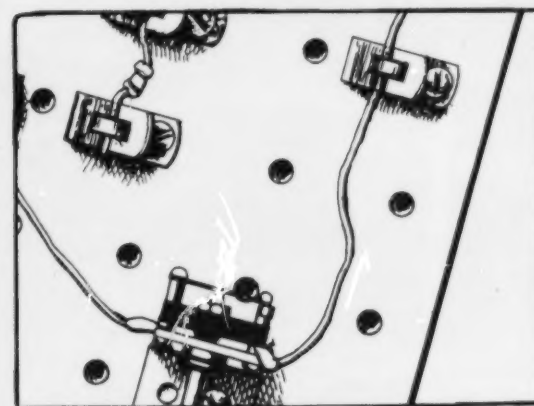
STEP 9 — Take the next wire from the left, the one you soldered to the coil, and place it in the fahnstock clip as shown. This clip has the diode in it.



STEP 10 — Take the last wire and place it in the fahnstock clip as shown.



STEP 11 — Take the wire that is on the left of the variable capacitor and place it in the fahnstock clip that you placed the two wires in.



STEP 12 — Take the wire that is on the right of the variable capacitor and place it in the fahnstock clip that you placed the last wire from coil "B" in.

Check Point

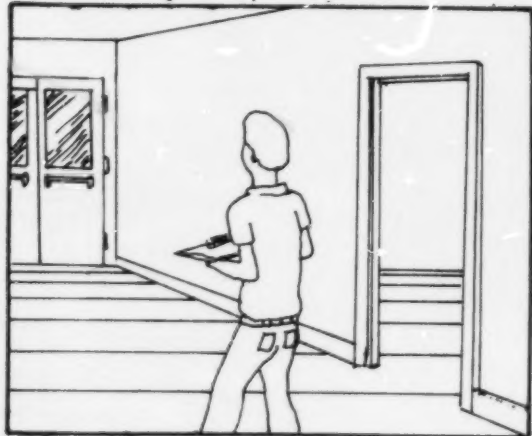
Did you scrape the ends of the wires coming from the coil?

Did you properly connect all the wires?

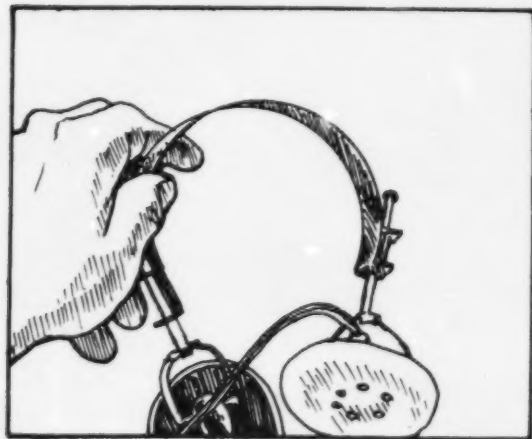
Is the diode connected exactly as shown in the illustration?

Instructional Objective IV

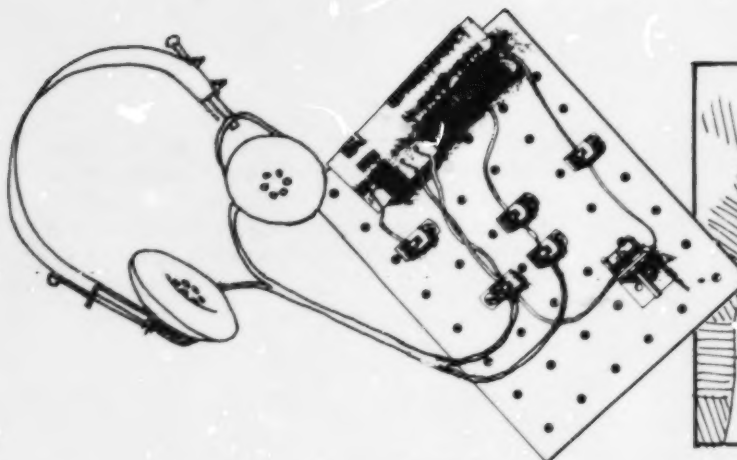
The student will tune in a radio station.



STEP 1 — Go to the area that your instructor has set up for testing the crystal set receiver.



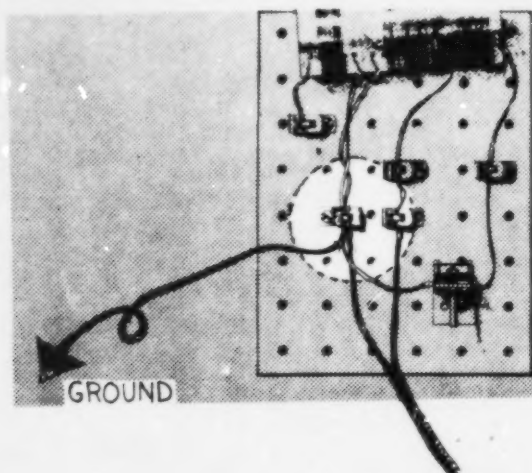
STEP 2 — Locate the headset.



STEP 3 — Hook up the headset to the base using the fahnstock clips as shown.



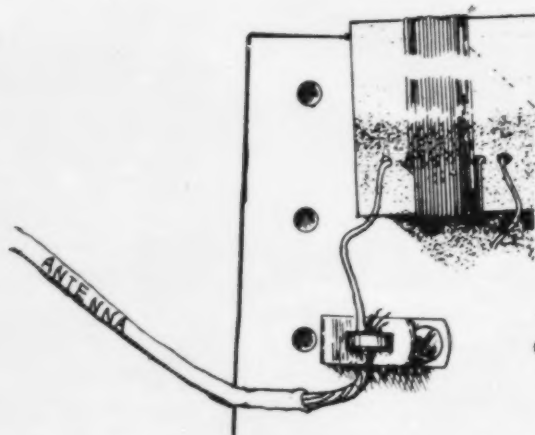
STEP 6 — Put on the headset.



STEP 4 — Connect the wire that is labeled "ground" to the fahnstock clip as shown.



STEP 7 — Slowly turn the shaft on the variable capacitor until you hear a radio station. You must listen very carefully because it will not be very loud.



STEP 5 — Connect the wire that is labeled "antenna" to the fahnstock clip with the left wire from coil "A" in it.

Check Point

Did you connect the headset, ground, and antenna wires to the proper fahnstock clips?

Did you hear a radio station?

OCCUPATIONAL DESCRIPTIONS

720.281-010 RADIO REPAIRER (any ind.) trouble shooter, radio.

Repairs radio receivers, phonographs, recorders, and other electronic-audio equipment, using circuit diagrams and test meters: - Tests wiring, tubes, resistors, and other parts, using electronic test equipment, such as voltmeters and oscilloscopes, to locate defects. Replaces defective parts, using handtools, and solders loose connections with soldering iron. May compute charges for labor and materials. May install radios in automobiles [AUTOMOBILE-ACCESSORIES INSTALLER (auto. ser.)]. May be designated according to type of radio repaired as AUTOMOBILE RADIO REPAIRER (any ind.); RADIO REPAIRER, DOMESTIC (any ind.).

repairs or replaces defective parts, using handtools and soldering iron. Repairs radios and other audio equipment [RADIO REPAIRER (any ind.)]. May install television sets [TELEVISION INSTALLER (any ind.)].

720.281-014 TAPE-RECORDER REPAIRER (any ind.)

Tests, repairs, and adjusts tape-recording machines, following schematic diagrams and manufacturer's specifications, using handtools and electronic testing instruments: Disassembles machine and replaces worn parts, such as sprocket wheels, drive belts, electrical switches, and guide rollers, using handtools. Records voice and listens to playbacks to detect distortion in sound. Tests circuits, using instruments, such as voltmeters, oscilloscopes, audiogenerators, and distortion meters. Replaces defective resistors, condensers, and tubes. Solders loose connections. Tests operation of repaired recorder.

720.281-018 TELEVISION-AND-RADIO REPAIRER (any ind.) television repairer.

Repairs and adjusts radios and television receivers, using handtools and electronic testing instruments: Tunes receiver on all channels and observes audio and video characteristics to locate source of trouble. Adjusts controls to obtain desired density, linearity, focus, and size of picture. Examines chassis for defects. Tests voltages and resistances of circuits to isolate defect, following schematic diagram and using voltmeter, oscilloscope, signal generator, and other electronic testing instruments. Tests and changes tubes. Solders loose connections and